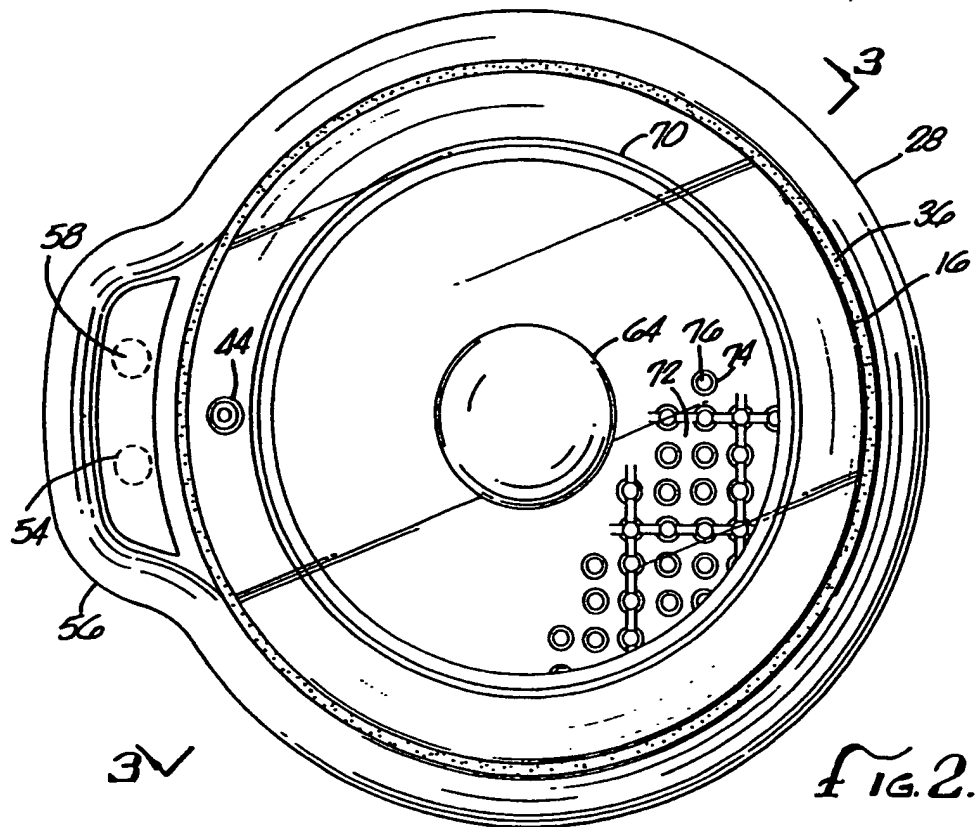
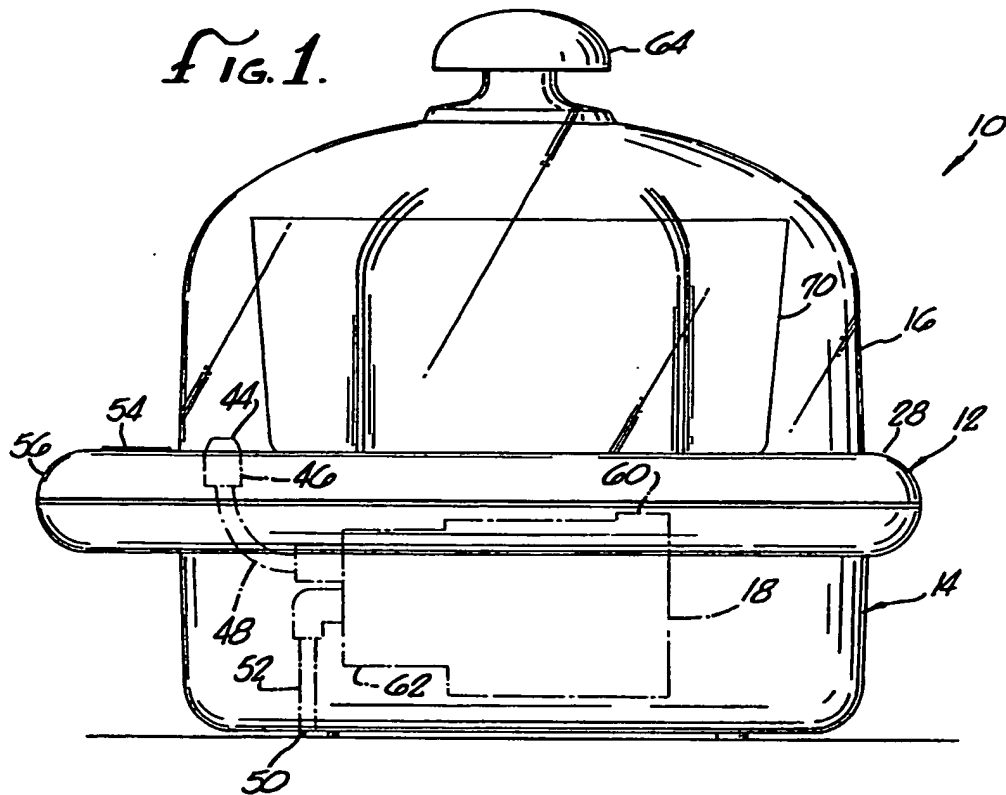




## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

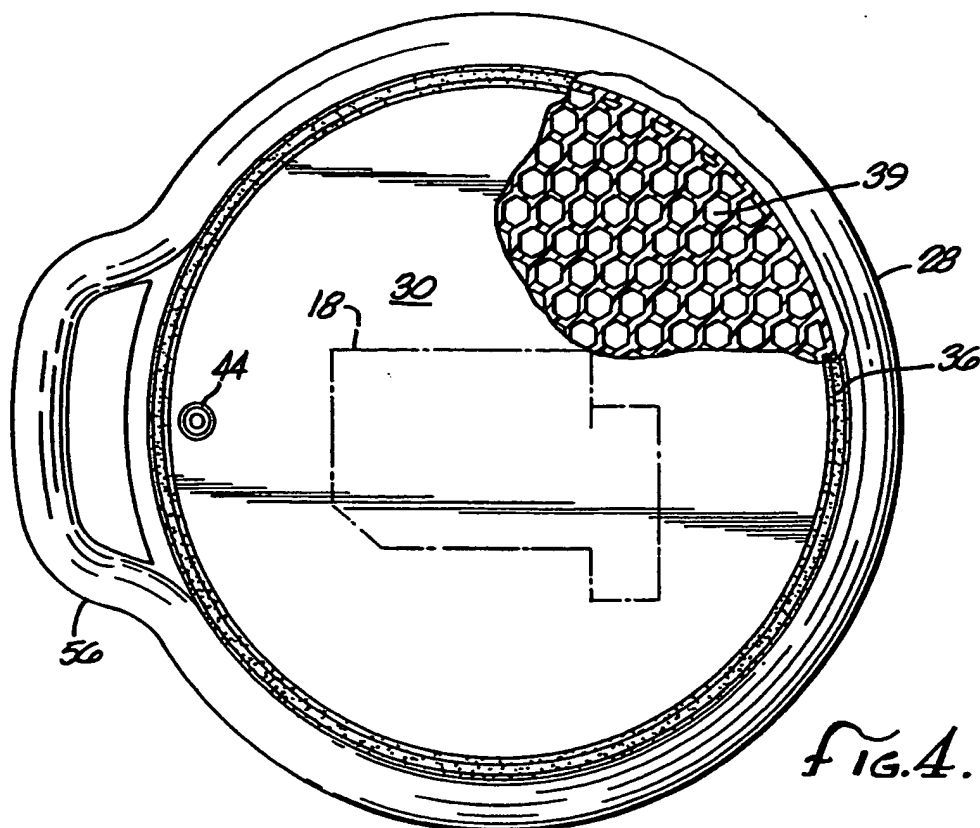
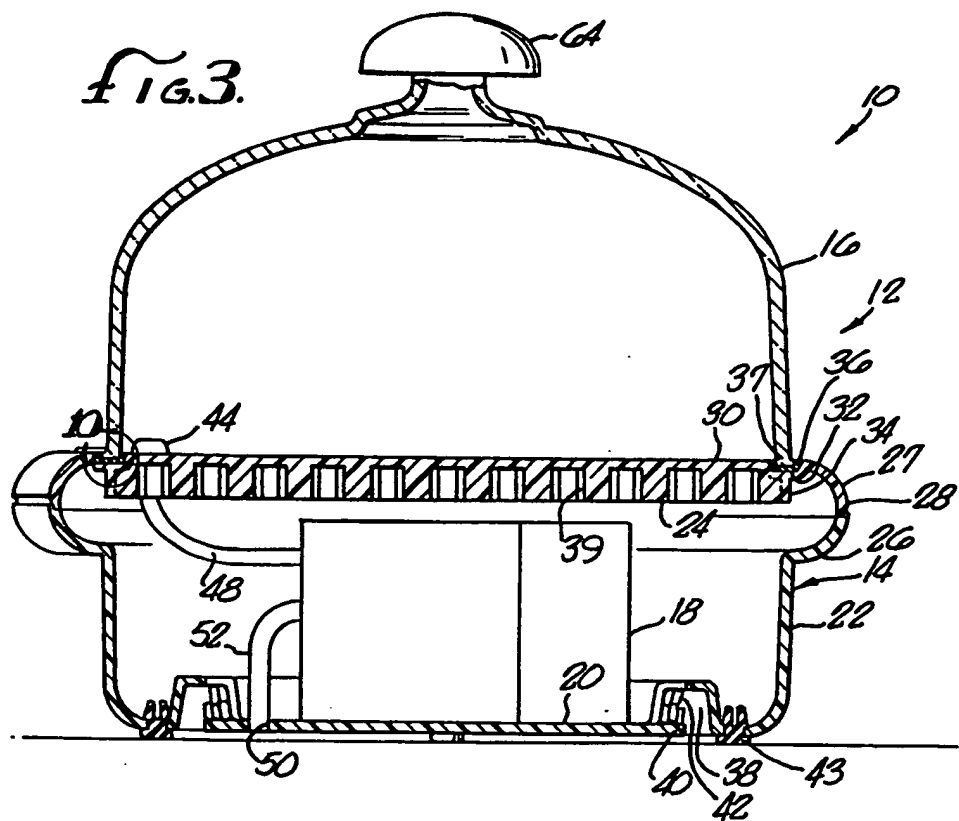
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|--|-----------|---|
| <p>(51) International Patent Classification <sup>4</sup> :<br/>A22C 9/00, A23L 1/318</p>   | <p>A1</p> | <p>(11) International Publication Number: WO 90/11691</p> <p>(43) International Publication Date: 18 October 1990 (18.10.90)</p>  |
| <p>(21) International Application Number: PCT/US89/01347</p> <p>(22) International Filing Date: 3 April 1989 (03.04.89)</p> <p>(71) Applicant: BC ENGINEERING INC. [US/US]; 417 West Fairway Boulevard, Big Bear City, CA 92314 (US).</p> <p>(72) Inventors: DAVIDSON, Peter, G. ; 27308 Pacific Coast Highway, Malibu, CA 90265 (US). CLARK, Robert, H., III ; 624 Cove Drive, Big Bear Lake, CA 92315 (US).</p> <p>(74) Agents: LYON, Richard, E., Jr. et al.; Lyon &amp; Lyon, 611 West Sixth Street, 34th floor, Los Angeles, CA 90017 (US).</p>   |           | <p>(81) Designated States: AT (European patent), AU, BE (European patent), CH (European patent), DE, DE (European patent), FR (European patent), GB, GB (European patent), IT (European patent), JP, LU (European patent), NL (European patent), SE (European patent).</p> <p>Published<br/>With international search report.</p> |
| <p>(54) Title: APPARATUS AND PROCESS FOR MARINATING FOODSTUFFS</p> <div data-bbox="438 1127 1198 1764" data-label="Image"> </div>  |           |   |
| <p>(57) Abstract</p> <p>An apparatus (10) and process for marinating foodstuffs in a short period of time are disclosed. The apparatus (10) includes a base assembly (14) defining a support surface (30), a removable cover (16) disposed over the support surface (30) and defining therewith an air-tight vessel (12) for holding the foodstuffs and the marinade, and a vacuum pump assembly (18) for withdrawing air from the vessel through vacuum port (44) communicating therewith. Upon withdrawing the air from the vessel (12) and reducing the pressure therein, the foodstuffs expand and air is drawn out of the foodstuffs. Creating voids therein, and, upon opening a pressure relief valve (62) and returning the pressure therein to atmospheric, the marinade is drawn into the voids in the foodstuffs, thereby tenderizing and imparting flavor to the foodstuffs.</p> |           |   |

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**SUBSTITUTE SHEET**

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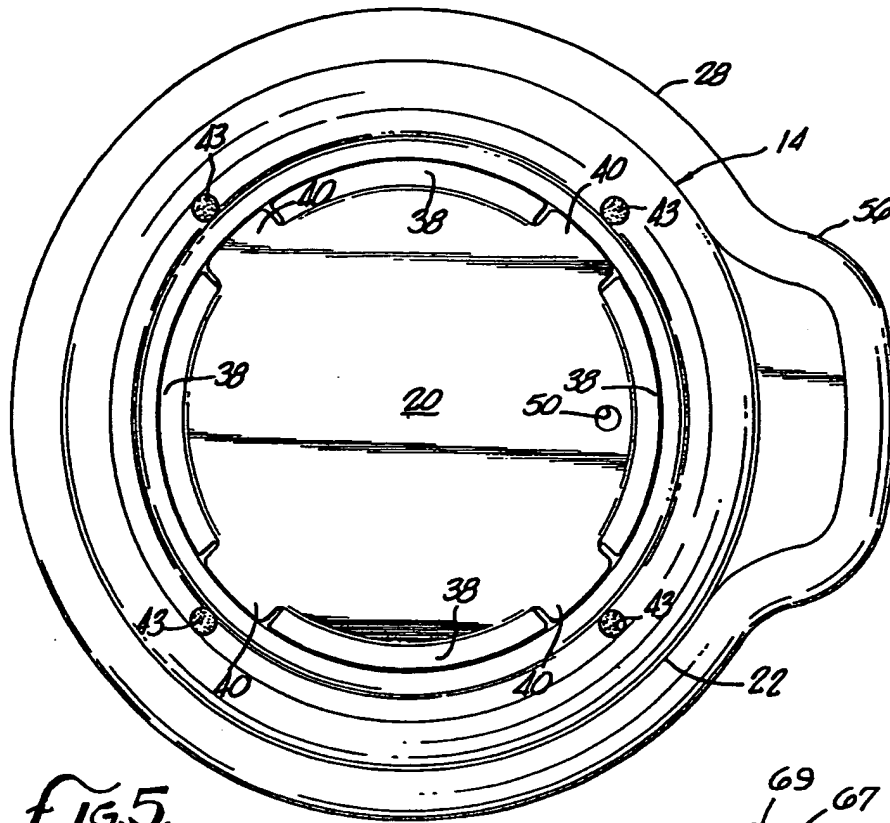


FIG. 5.

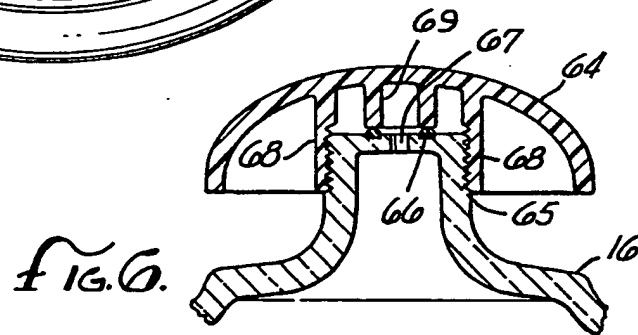


FIG. 6.

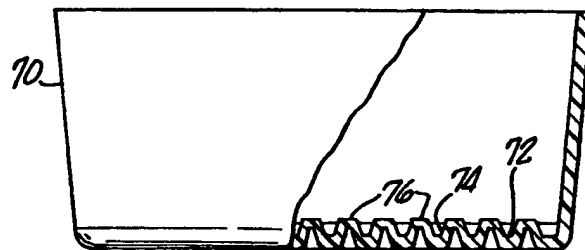
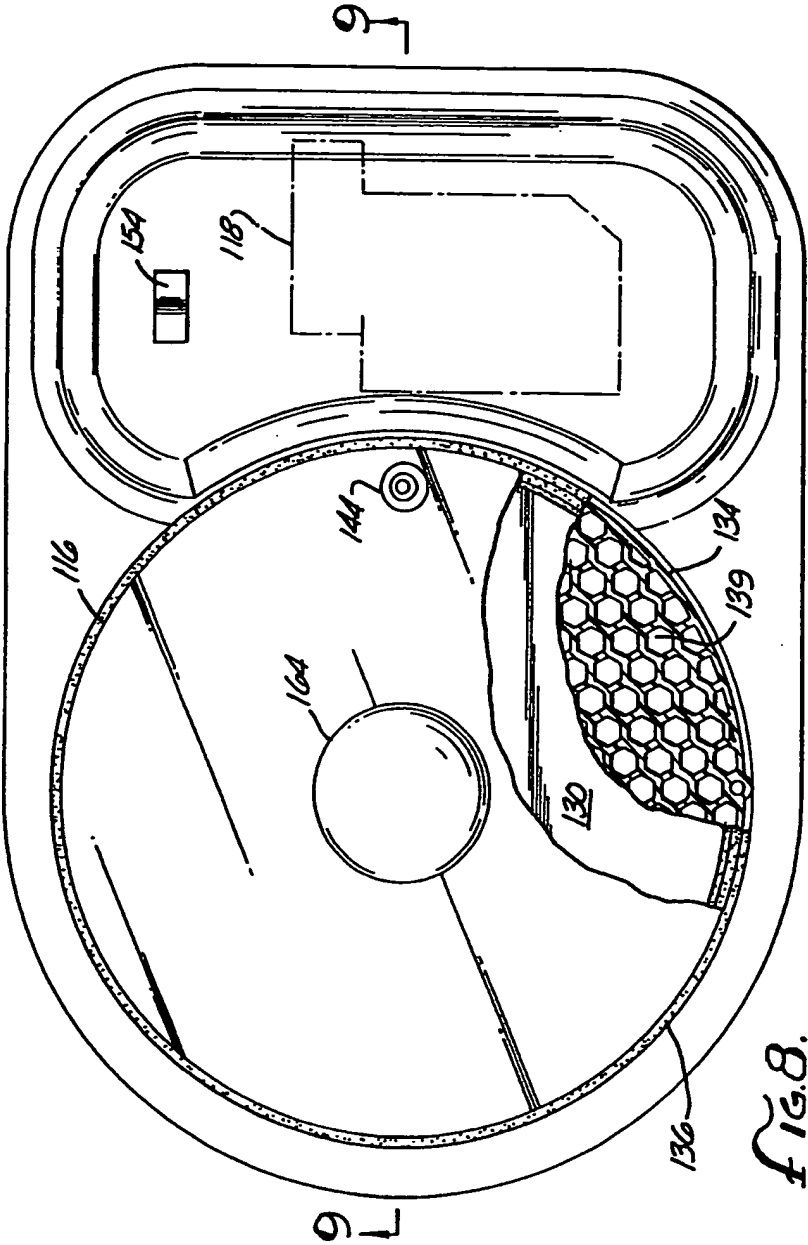
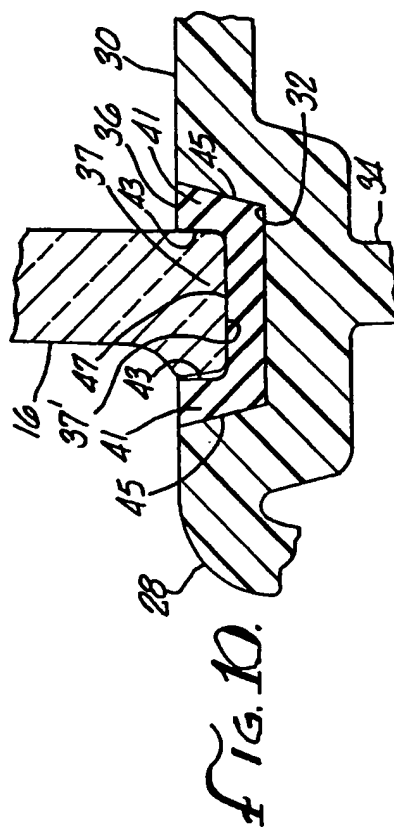
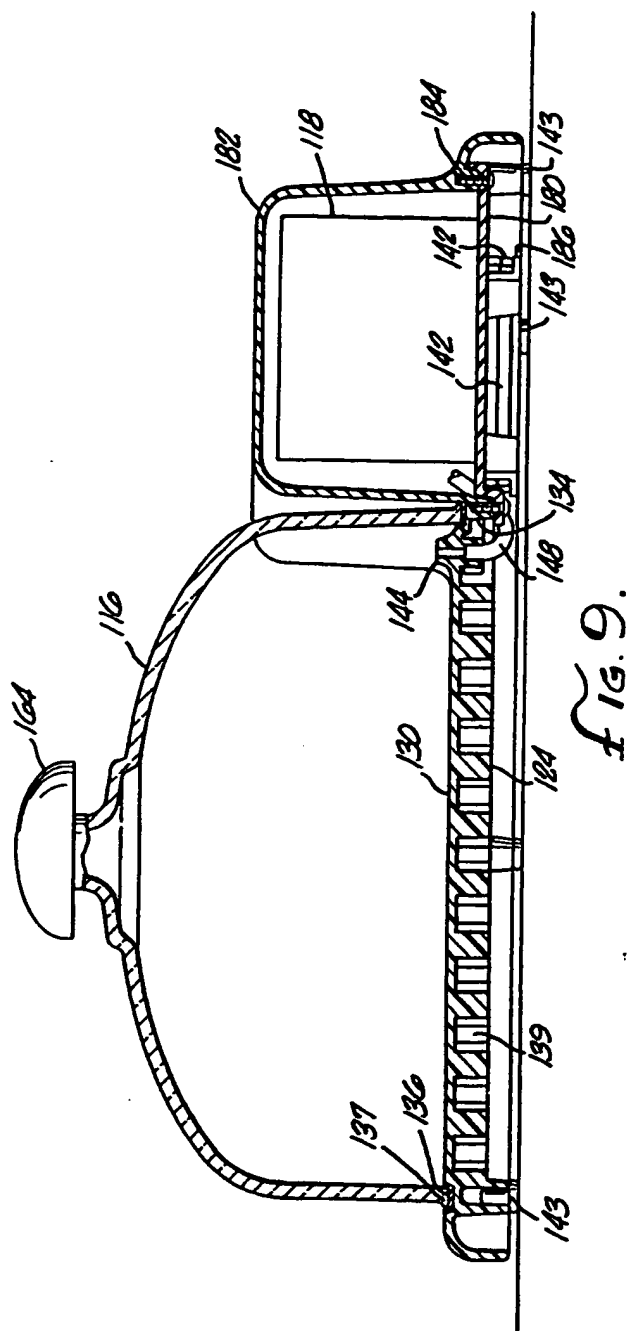


FIG. 7.





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### DESIGNATIONS OF "DE"

Until further notice, any designation of "DE" in any international application whose international filing date is prior to October 3, 1990, shall have effect in the territory of the Federal Republic of Germany with the exception of the territory of the former German Democratic Republic.

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S P E C I F I C A T I O N  
APPARATUS AND PROCESS FOR MARINATING FOODSTUFFS

This is a continuation-in-part of Serial No. 142,183, filed January 11, 1988, and entitled Apparatus and Process for Marinating Foodstuffs.

BACKGROUND OF THE INVENTION

It is common practice to marinate less expensive cuts of meat prior to cooking, particularly when barbecuing, to tenderize and improve the flavor thereof. While marinating is generally successful in enhancing the flavor of the meat, its ability to tenderize is somewhat limited, and it is a very time consuming process. Allowing meat to rest in a marinade for as long as twenty-four hours prior to cooking is common. As time does not always permit such thorough marinating, the quality of the cooked steak is often less than what it would have been with proper preparation.

While marinating is generally not necessary with the higher quality and more expensive cuts of meat, lesser cuts, such as flank and should steaks, will generally suffer in quality if not thoroughly marinated prior to cooking. Accordingly, people will often refrain from purchasing the less expensive cuts of meat because they either do not have the time to marinate the meat properly, and/or because they feel such meat is not sufficiently tender. While marinating is a simple process, the time it takes is often a substantial problem.

It would therefore be highly desirable to provide a means for thoroughly marinating foodstuffs which greatly reduces the time required to achieve the desired result. The apparatus



and process disclosed herein not only thoroughly marinates foodstuffs in a small fraction of the time heretofore required for the process, but tenderizes the food stuffs to a greater extent than conventional marinating. Such an apparatus and process is also described in copending application, Serial No. 142,183, filed January 11, 1983. While the process disclosed therein is basically the same as that disclosed here, the apparatus disclosed herein has been modified to facilitate manufacture while retaining all of the benefits of the new marinating process.

#### SUMMARY OF THE INVENTION

Briefly, the present invention is directed to an apparatus and process for rapidly marinating foodstuffs to enhance the flavor and tenderness thereof. The apparatus includes a pressure-tight vessel and a pump assembly for withdrawing air from the vessel and maintaining the interior of the vessel at a reduced pressure. The foodstuff to be marinated is placed in a marinade within the vessel. The pressure within the vessel is then reduced by withdrawing air from the vessel, causing the foodstuff to swell, while the air trapped within the food is drawn therefrom. The foodstuff is then allowed to remain in the marinade for a short period of time, whereupon the interior of the vessel is returned to atmospheric pressure. As the pressure rises within the vessel, the marinade passes into the foodstuffs, filling the voids created by the existing air, thereby rapidly tenderizing and imparting the flavor of the marinade to the foodstuffs.

It is the principal object of the present invention to provide a method and apparatus for thoroughly marinating foodstuffs in a short period of time.

It is another object of the present invention to provide a method and apparatus for rapidly imparting the flavor of a marinade to an inexpensive cut of meat, while concurrently tenderizing the meat.

It is yet another object of the present invention to provide apparatus for thoroughly marinating foodstuffs in a short period of time which is of simple construction and economical to manufacture.

These and other objects and advantages of the present invention will become apparent from the following detailed description taken in conjunction with the accompanying drawings.

#### DESCRIPTION OF THE PREFERRED EMBODIMENT

Figure 1 is a side view of the first embodiment of the present invention.

Figure 2 is a top view of the first embodiment of the present invention illustrating a container therein for holding the foodstuffs to be marinated and the marinade and showing a portion of the interior bottom surface of the container.

Figure 3 is a sectional view taken along line 3-3 in Figure 2.

Figure 4 is a sectional top view of the first embodiment of the present invention with a portion of the support surface broken away to illustrate the honeycomb structure of the underside of the upper wall portion of the base assembly.

Figure 5 is a bottom view of the first embodiment of the present invention.

Figure 6 is an enlarged sectional view of a pressure relief valve in the handle of the cover of the present invention.

Figure 7 is a partial sectional view of an open container for holding the foodstuffs and the marinade in the apparatus of the present invention.

Figure 8 is a top view of a second embodiment of the present invention with a portion of the support surface broken away to illustrate the honeycomb structure of the underside of the horizontal wall portion of the base assembly.

Figure 9 is a sectional view taken along line 9-9 in Figure 8.

Figure 10 is an enlarged sectional view of the sealing ring and lower end portion of the cover of the present invention.

Referring now in detail to the drawings, the marinating device 10 of the present invention illustrated in Figures 1 - 7 and 10 comprises a pressure-tight vessel 12 defined by a base assembly 14 and a removable lid or cover 16, and a vacuum pump assembly 18 disposed within the base assembly for evacuating air from the vessel 12 to effect rapid marinating of the foodstuffs disposed therein in the manner to be described.

The base assembly 14 is of a circular configuration, preferably constructed of ABS plastic, and defines a bottom wall portion 20, a side wall portion 22, and an upper wall portion 24, with the vacuum pump assembly 18 being disposed interiorally thereof. The side wall portion 22 of the base assembly 14 extends upwardly from the bottom wall portion 20 and curves outwardly at 26 so as to abut and be joined with the

correspondingly configured extended end 27 of the upper wall portion 24 to define a semi-circular annular carrying rib 28 extending about the perimeter of the base assembly 14 adjacent the upper end thereof. The upper wall portion 24 of the base assembly 14 defines a circular support surface 30 inwardly of carrying rib 28, an annular recess 32 between support surface 30 and carrying rib 28, and an annular vertical support rib 34 disposed below recess 32. A generally "U"-shaped annular sealing ring 36, preferable constructed of silicone rubber, is disposed within recess 32 for sealing engagement with the lower annular end portion 37 of cover 16. Cover 16, support surface 30 of base assembly 14 and sealing ring 36 thus define the air-tight vessel 12.

As seen in Figure 10, sealing ring 36 is preferably configured such that the upstanding arm portions 41 thereof define vertical interior surfaces 43 adapted to sealably engaged the vertical side wall of the lower end portion 37 of cover 16, and the exterior surfaces 45 of arm portions 41 are slightly tapered to mate with the corresponding configured sides of recess 32. The flat spanning portion 47 of sealing ring 36 sealably engages the flat annular end surface 37' of cover 16. In the preferred configuration of cover 16, the annular end portion 37 is of an increased transverse dimension to effect better sealing contact between end surface 37' and sealing ring 36. The resultant configuration effects a secure air-tight seal between the cover 16 and base assembly 14 about support surface 30. Cover 16 is preferably dome-shaped and constructed of translucent polycarbonate, although the cover could be constructed of glass if desired.

To enable the upper wall portion 24 of the base assembly to withstand the stress created by evacuating the air from within cover 16 without the need for additional reinforcement, the underside thereof defines a honeycomb structure 39 interiorly adjacent the annular vertical support rib 34 as seen in Figures 3 and 4. The resultant structure minimizes the deflection of the upper wall portion 24 and of the support surface 30 into cover 16 upon the air therein being evacuated and minimizes any rotational deflection of the perimeter portion of the support surface 30 below the depending end portion 37 of cover 16 so as to increase the durability of the apparatus and continually maintain an air tight seal between the support cover 16 and the sealing ring 36.

The bottom wall portion 20 of base assembly 14 preferably defines an annular recess 38 therein, partially enclosed by a radial flange 40 so that the electrical outlet cord 42 of the vacuum pump assembly 18 can be secured by flange 40 and disposed within the recess 38 for storage purposes. A plurality of rubber foot members 43 are also preferable mounted in the bottom wall 20 of the base assembly 14 to dampen any vibration during operation of the vacuum pump assembly 18.

The vacuum pump assembly 18 is preferably of a conventional configuration capable of drawing a vacuum within the range of 15-24 in. Hg to provide both an efficient and economical marinating device. It should be noted, however, that vacuum pump assemblies having a larger pumping capacity could also be employed, albeit at greater expense, so as to be capable of drawing a vacuum within cover 16 up to about 27 in. Hg. The vacuum pump assembly 18 is secured to the interior surface of the

bottom wall portion 20 of base assembly 14 and communicates with the interior of vessel 12 by means of a vacuum inlet port 44 formed in the upper wall portion 24 of base assembly 14, preferably inwardly adjacent the perimeter thereof. A conventional conduit fitting 46 and an air conduit 48 which extends between inlet port 44 and the air inlet of pump assembly 18 are provided to communicate port 44 with the vacuum pump assembly 18. An exhaust port 50 is provided in bottom wall 20 of the base assembly which in turn communicates with the vacuum pump assembly 18 by means of conduit 52 for the evacuation of air from the vacuum pump assembly.

An activating switch 54 is provided for vacuum pump assembly 18 and is preferable located on a radial extension 56 of the carrying rib 28 formed by the extended end portions of the side and upper wall portions 22 and 24 of the base assembly 14. An indicator light 58 can also be provided in extension 56 adjacent switch 54 for illumination when the valve pump assembly is activated. An automatic timer 60 is preferably provided with and operatively connected to the vacuum pump assembly 18 for automatically deactivating the pump assembly after about three to five minutes of operation. A pressure relief valve 62 is provided to release the vacuum within vessel 12 upon deactivation of the pump assembly. Without such a pressure relief valve, the cover 16 could not be removed from the base assembly 14 due to the reduced pressure therein.

A pressure relief valve 62 could be provided in the vacuum pump assembly 18 itself such that the pressure would be automatically released upon deactivation of the pump assembly, or, alternatively, a manually activated pressure relief valve

could be provided, as for example, in an upper handle 64 secured to cover 16 to relieve the reduced pressure within cover 16. An example of such a valve mechanism is illustrated in Figure 6. As seen therein, the upper end of cover 16 defines an upstanding neck portion 65 having an "O"-ring 66 mounted in the upper end thereof about an air inlet aperture 67. Handle 64 defines a first depending cylindrical extension 68 which is in threaded engagement with neck portion 65 and a second inwardly spaced cylindrical extension 69 adapted to abut "O"-ring 66 and thereby seal inlet aperture 67 upon the handle 64 being tightened down about the neck portion 65 of cover 16. Upon rotating handle 64 so as to move the handle upwardly on neck portion 65, extension 69 moves away from "O"-ring 66, breaking the air-tight seal therebetween and allowing air to pass between the engaged threads on the neck portion 65 of cover 16 and extension 68 of handle 64 and into the interior of cover 16 through aperture 67. A stop (not shown) can be provided, if desired, in the path of the mating threads to limit counter-clockwise rotation of the handle 64 on the cover 16 and thereby prevent removal of the handle from the cover.

To prevent the marinade from passing into the vacuum inlet port 44 of the base assembly, the foodstuffs to be marinated and the marinade are placed within a separate open container 70 which rests on the support surface 30 of the base assembly 14 under cover 16. In the preferred construction of container 70, the bottom interior surface 72 thereof is provided with a plurality of frustoconical projections 74, with each projection terminating at its upper end in a support surface 76 as seen in Figure 7. The plurality of individual support

surfaces 76 are co-planar so as to define a support surface for the foodstuffs to be marinated which is elevated above the bottom interior surface 72 of container 70 to provide continual access of the marinade to the underside of the foodstuffs therein. Other configurations of the interior bottom surface of container 70, such as elevated ribs, could also be employed for this purpose.

In use, the foodstuffs to be marinated are placed within the open container 70, marinade is then poured into the container 70 to a desired depth, the container is then placed on the support surface 30 of base assembly 14 and the cover 16 is disposed atop the base assembly such that the annular end portion 37 thereof is disposed within the sealing ring 36. The vacuum pump assembly 18 is then activated by switch 54, drawing air out of the chamber defined by the cover 16 and support surface 30 to create a pressure differential within the range of 15-27 in. Hg. As the pressure within the vessel drops, the air within the meat or other foodstuffs is drawn out of the foodstuffs and bubbles to the surface of the marinade. As the vacuum increases, more air evacuates the foodstuffs. After about four to five minutes, the marinating process is complete. The vacuum pump assembly 18 is deactivated and the vacuum within the vessel is released by the pressure relief valve 64. As the air pressure rapidly increases within the vessel 12, the marinade invades the foodstuffs, flowing into the voids therein created by the exiting air.

In a test utilizing the aforesaid process with a boneless beef chunk shoulder steak, it was found that a vacuum of about 24 in. Hg was obtained after about one minute of activation of the vacuum pump. This vacuum was maintained for four minutes



whereupon the pump was deactivated and the chamber about the foodstuffs was returned to atmospheric pressure. The steak was then reweighed. The result was a weight increase of the meat of about 2.3 percent which represented a more thorough marinating of the meat in five minutes than was obtained in twenty-four hours of marinating by the conventional process.

A second embodiment of the present invention is illustrated in Figures 8 and 9. This embodiment differs from the prior embodiment in the configuration of the base assembly and the relative positioning of the vacuum pump assembly with respect to the cover and support surface. In the second embodiment, the vacuum pump assembly 118 is disposed on the base assembly 114 adjacent the cover 116 as opposed to being disposed below the cover as in the prior embodiment. The operation and functioning of the two embodiments is the same.

As in the first embodiment of the marinating device, the second embodiment employs a dome-shaped cover 116 and a base assembly 114, with the base assembly defining a horizontal wall portion 124 which in turn defines an upper circular flat support surface 130 disposed above a honeycomb support structure 139. An annular sealing ring 136 of the same configuration as sealing ring 36 is provided in a recess disposed about support surface 130 for sealing engagement with the lower annular end portion 137 of the cover 116. The vacuum pump assembly 118 is mounted on a portion 180 of the base assembly 114 adjacent sealing surface 130 and a vacuum pump assembly cover 182 is provided about the vacuum pump assembly 118 and secured thereto by suitable fastening means 184. A plurality of "L"-shaped flanges 186 are provided on the underside of surface 180 below

the vacuum pump assembly 118 for storage of the electrical outlet cord 142 of the vacuum pump assembly. The vacuum pump assembly communicates with the interior of cover 116 by means of a port 144 preferably formed in the perimeter portion of support surface 130 and an air conduit 148 extending between port 144 and the vacuum pump assembly. An exhaust port (not shown) is also provided in base assembly below the vacuum pump assembly for the evacuation of the air from the interior of cover 116, and, as with the prior embodiment, a plurality of foot members 143 are provided in the underside of the base assembly 114 to dampen vibration. A pressure relief valve is also provided either in the vacuum pump assembly 118 or in the handle 164 of the cover 116. It is to be understood, however, that in either of the embodiments of the invention, the pressure relief valve could be disposed at other locations communicating with the interior of the marinating device cover to effect the passage of air into the interior thereof to return the pressure therein to atmospheric.

Various other changes and modifications may be made in carrying out the present invention without departing from the spirit and scope thereof. Insofar as these changes and modifications are within the purview of the appended claims, they are to be considered as part of the present invention.

We claim:

1. An apparatus for marinating foodstuffs in a marinade comprising: a base assembly; a support surface defined by said base assembly; a removable cover disposed over said support surface; sealing means disposed about said support surface and adapted to abut said cover for forming an air-tight seal therebetween; a vacuum port disposed in said support surface; a vacuum pump assembly carried by said base assembly in fluid communication with said port for withdrawing air from the interior of said cover through said port to reduce the pressure within said cover to about 15-27 in. Hg. below atmospheric pressure; and means for activating and deactivating said pump assembly.

2. The apparatus of Claim 1 wherein said support surface is circular and defines a honeycomb structure on the underside thereof to prevent said surface from being deformed and drawn partially into said cover upon the pressure within said cover being reduced by said vacuum pump assembly.

3. The apparatus of Claim 2 including an annular upstanding supporting rib member defined by said base assembly and extending about said support surface and below said sealing means.

4. The apparatus as in Claims 1, 2 or 3 wherein said base assembly defines an annular recess therein disposed about said support surface and wherein said sealing means comprises an annular sealing ring generally "U"-shaped in cross section and is disposed in said recess.

5. The apparatus of Claim 4 wherein said sealing ring defines upstanding arm portions, said arm portions defining substantially vertical interior surfaces adapted to abut in sealing engagement with portions of said cover and defining tapered exterior surfaces adapted to abut portions of said base assembly about said annular recess therein.

6. An apparatus for marinating foodstuffs in a marinade comprising: a base assembly including a bottom wall portion, a side wall portion, and an upper wall portion; a circular support surface defined by said upper wall portion; an annular sealing member disposed in said upper wall portion and extending about said support surface; a removable cover adapted to be disposed over said support surface and in sealing engagement with said annular sealing member; a vacuum port disposed in said upper wall portion of said base assembly; a vacuum pump assembly disposed within said base assembly and carried by said bottom wall portion thereof, said vacuum pump assembly being in fluid communication with said port for withdrawing air from the interior of said cover through said port to reduce the pressure within said cover to about 15-27 in Hg. below atmospheric pressure; means for activating said pump assembly; means for deactivating said pump assembly upon the passage of a predetermined amount of time; and means for returning the pressure within said cover to atmospheric upon deactivation of said pump assembly.

7. The assembly of Claim 6 wherein said upper wall portion defines a honeycomb support structure below said support surface and a vertical rib below said sealing means.

8. The assembly as in Claims 6 or 7 including an annular recess disposed in said upper wall portion of said base assembly, said sealing member being disposed in said recess, being substantially "U"-shaped in cross section, and defining a pair of upstanding arm portions and a spanning portion, said arm portions defining substantially vertical interior contact surfaces and inclined exterior surfaces, said spanning portion being adapted to abut a first portion of said cover, said interior contact surfaces being adapted to abut a second portion of said cover adjacent said first portion, and said external contact surfaces abutting portions of said upper wall portion of said base assembly about said recess therein.

9. The apparatus as in Claims 6 or 7 wherein said pressure release means comprises a handle threadably engaging said cover, an air inlet aperture disposed in said cover below said handle, an annular sealing member carried by said cover about said aperture and a cylindrical contact member depending from said handle and adapted to either bear against said annular sealing member on said cover or be spaced therefrom depending on the rotational direction of said handle with respect to said cover to effect opening and closing of said air inlet aperture in said cover.

10. An apparatus for marinating foodstuffs in a marinade comprising: a base assembly including a first circular support surface and a second support surface, said second surface being disposed adjacent said first surface; an annular sealing member disposed about said first support surface; a removable cover adapted to be disposed over said first support surface and in sealing engagement with said annular sealing member; a vacuum

port disposed in said first support surface; a vacuum pump assembly disposed on said second support surface, said vacuum pump assembly being in fluid communication with said port for withdrawing air from the interior of said cover through said port to reduce the pressure within said cover to about 15-27 in. Hg. below atmospheric pressure; and means for activating and deactivating said pump assembly.

11. The apparatus of Claim 10 wherein said first support surface defines a honeycomb structure on the underside thereof to prevent said support surface from being deformed and drawn partially into said cover upon the pressure with said cover being reduced by said pump assembly.

12. A process for marinating foodstuffs in a short period of time consisting only of the steps of: placing the foodstuffs in a marinade in an air-tight vessel; reducing the pressure within the vessel to a level of about 15-27 in. Hg. below atmospheric pressure; allowing the foodstuffs to remain at rest in the marinade for about 3-5 minutes; introducing air into the vessel to raise the pressure therein to atmospheric; and removing the foodstuffs from the marinade.

# INTERNATIONAL SEARCH REPORT

International Application No. PCT/US89/01347

## I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) \*

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC(4): A22C 9/00; A23L 1/318

U.S. Cl.: 99/472; 426/281, 486

## II. FIELDS SEARCHED

Minimum Documentation Searched <sup>7</sup>

Classification System

Classification Symbols

U.S.

99/468, 472; 426/281, 486

Documentation Searched other than Minimum Documentation  
to the Extent that such Documents are Included in the Fields Searched <sup>8</sup>

## III. DOCUMENTS CONSIDERED TO BE RELEVANT \*

| Category * | Citation of Document, <sup>11</sup> with indication, where appropriate, of the relevant passages <sup>12</sup> | Relevant to Claim No. <sup>13</sup> |
|------------|--|-------------------------------------|
| X          | US,A, 3,370,959 (MOORE ET AL)<br>27 February 1968, See column 3, lines 23-38.                                  | 12                                  |
| Y          | US,A, 3,928,634 (GASBARRO)<br>23 December 1975, See Figure 1.  | 1,6 and 10                          |
| Y          | US,A, 2,629,311 (GRAVES)<br>24 February 1953, See column 2, lines 19-53.                                       | 1,6 and 10                          |
| A          | US,A, 4,018,908 (GROSS)<br>19 April 1977, See entire document.   | 1-11                                |
| A          | US,A, 4,321,862 (STEVENSON)<br>30 March 1982, See entire document.   | 1-11                                |
| A          | US,A, 2,157,624 (OVERMYER)<br>09 May 1939, See entire document.  | 9                                   |
| E, &       | US,A, 4,818,550 (DAVIDSON ET AL)<br>04 April 1989, See entire document.  | 1-12                                |

\* Special categories of cited documents: <sup>10</sup>

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"A" document member of the same patent family

## IV. CERTIFICATION

Date of the Actual Completion of the International Search

Date of Mailing of this International Search Report

16 November 1989

05 DEC 1989

International Searching Authority

ISA/US

Signature of Authorized Official  
WILBUR L. BASCOMB, JR.